

REMARKS

Claim 1 was previously cancelled. Claims 6, 17 and 18 are herein cancelled, without prejudice or disclaimer. Claims 19 - 23 are herein added. Accordingly, Claims 2 - 5, 7 - 16 and 19 - 23 are presently pending in the application.

I. Rejection of Claim 2 Under 35 U.S.C. § 103

The instant rejection contends that the combination of WO 90/12387 (“Aubusson”) with U.S.P. No. 5,828,684 (“Van de Walle”) teaches or suggests all of the features of Applicant’s claim 2. This rejection is respectfully traversed as set forth in the following four rationales.

First, independent claim 2 recites a modulation unit which modulates ultraviolet laser light. The basis for rejection contends that electro-optic deflector 13 of Aubusson modulates laser light. Simply stated, this is incorrect. Electro-optic deflector 13 corrects irregularities in the raster scan pitch caused by mirrors 14, 16 (*see* top of page 4, bottom of page 7 and top of page 8). Therefore, the reliance in the basis for rejection on element 13 to teach modulation is improper.

Second, assuming for sake of argument that Aubusson did teach a modulator, any combination of Aubusson with Van de Walle is improper, as herein explained. To begin with, the basis for rejection correctly concedes that Aubusson does not include a semiconductor laser structure having an active layer comprising GaN (*see* the paragraph labeled as number “9” in the instant Office Action). Additionally, the basis for rejection fails to provide any motivation for combining Aubusson with Van de Walle. Indeed, the basis for rejection merely contends that GaN lasers are well-known. Such a basis for a motivation to combine is insufficient. *See*

M.P.E.P. § 2143.01. Additionally, the combination is also improper in view of the reliance in the basis of rejection on Applicant's own disclosure (wherein the instant Office Action cites to page 5, line 18 to page 6, line 8, of the instant application's specification) to teach the use of different types of lasers (*see* the paragraph labeled as number "9" in the instant Office Action). What Applicant discloses in the instant specification cannot be used as a basis for a prior art rejection. Therefore, the rejection is improper for at least these additional reasons.

Third, the basis for rejection states that Applicant must establish unexpected results in using an active layer of GaN material for the laser. However, because the basis for rejection does not rise to meet the burden of establishing a *prima facie* case of obviousness (as the motivation to combine Aubusson and Van de Walle is not established), Applicant is under no obligation to demonstrate unexpected results.

Along these lines, assuming, *arguendo*, that the basis for rejection was able to establish *prima facie* obviousness, it is further pointed out that the laser of the instant invention comprises a GaN active layer and is able to produce a UV scanning laser that has high efficiency and is invisible to the human eye, improving viewability. Thus, the GaN laser does have an unexpected result, contrary to the contentions in the basis for rejection.

Fourth, Aubusson teaches away from any combination with Van de Walle, and thus the combination is improper in that "references cannot be combined where references teach away from their combination." *See* M.P.E.P. § 2145(X)(D)(2). More precisely, Aubusson notes that the fluorescent phosphor materials react differently to different types of radiation (*see* Aubusson at page 9). Additionally, Aubusson relates to an argon ion laser which excites fluorescent phosphors (*see* page 9 of Aubusson). While an Ar⁺ gas laser may have a wavelength emission

of between 275 and 363.8 nanometers in the invisible spectrum and 408.9 to 686.1 nanometers in the visible spectrum, emissions at the lower wavelengths (275 - 363.8 nm) are of a very small power intensity, and emissions at the higher wavelengths (408.9 to 686.1 nm) are recognized as only having two wavelengths of any real output power: 480 and 514.5 nm (*see* www.chem.ufl.edu/~itl/4411L_f96/i2_lif/argonrii.html and www.cmste.uncc.edu/gas%20laser%20paper.doc).

Given the statement in Aubusson that “it could not be predicted that the different types of irradiation will necessarily produce the same effect” (*see* Aubusson at page 9), one of ordinary skill in the art would not be motivated to replace the argon laser of Aubusson, which has very little power output in the invisible spectrum (at wavelengths of 334 nm, 351 nm and 363.8 nm) and two main power outputs in the visible spectrum (480 nm and 514.5 nm) with a semiconductor laser emitting high power in the invisible spectrum (in a preferred embodiment, outputting a high power wavelength between 380 - 420 nm).

Therefore, at a very minimum, Aubusson teaches that there is not a reasonable expectation of success for combining the disclosed fluorescent phosphors with stimulating rays of a different wavelength (*id.*). It is well-settled that a valid obviousness rejection requires demonstration of some reasonable expectation of success. *See* M.P.E.P. § 2143.02. The express teachings of Aubusson undermine this requirement of an obviousness rejection. Therefore, in light of the previous four rationales and their supporting rationales, independent claim 2 is respectfully averred to be patentable and the Examiner is therefore respectfully requested to reconsider and withdraw this rejection.

II. Rejection of Claim 3 Under 35 U.S.C. § 103

Turning now to dependent claim 3, the basis for rejection concedes that Aubusson fails to teach or suggest a semiconductor laser device that is any one of a tapered-amplifier type, a α -DFB type, a phase-synchronization array type, or a surface emitting type. The Office Action cites U.S.P. Nos. 6,014,388 (“Fukunaga”), and/or 6,014,388 (“Takiguchi”), and/or 5,413,884 (“Koch”), and/or 5,321,712 (“Kahn”) as allegedly teaching or suggesting these features. Respectfully, this rejection is traversed for at least the following three reasons.

First, with regard to Fukunaga, both this reference and the present application shared a common obligation of assignment to Fuji Photo Film Co., Ltd, at the time of the creation of the later invention. The assignment for the present application was recorded on March 6, 2000 at Reel 10659/Frame 738. The assignment for Fukunaga is indicated on the face of the patent. In light of the previous, the cited Fukunaga reference is not applicable art against the instant invention as provided under 35 U.S.C. § 103(c). Accordingly, the Fukunaga reference fails to be proper prior art and must be withdrawn.

Second, claim 3 depends upon claim 2, thereby incorporating all the features of claim 2, including a semiconductor laser with an active layer of GaN. Koch and Takiguchi do not discuss an active layer of gallium nitride (Koch merely discusses photolithography and holographic exposure techniques, while Takiguchi merely discloses a laser with an indium gallium phosphide arsenic or an aluminum gallium indium phosphide active layer (see col. 1, line 31 and col. 3, line 8)).

Third, the secondary references may not be properly combined with Aubusson. As discussed above, Aubusson contemplates excitation of fluorescent phosphors using an Ar⁺ gas

laser (*see* Aubusson at page 9). Ar+ gas lasers have an appreciable power output *only* at 480 and 514.5 nm. In contrast, the secondary references teach much longer wavelengths than those specified as most appropriate for an Ar+ laser. For instance, Takiguchi teaches a wavelength range between 580 and 890 nm (see col. 1, lines 4 - 5), and Khan fails to state any range beyond stating that the surface emitting laser in fig. 2 emits a visible/ultraviolet laser (see col. 6, lines 6 - 7). Because Aubusson suggests that applying different wavelengths to the disclosed phosphors would not provide predictable results (*see* Aubusson at page 9), one skilled in the art would not combine Aubusson with any reference that teaches a laser output wavelength that differs from the output of an Ar+ gas laser. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this rejection.

III. Rejection of Claim 4 Under 35 U.S.C. § 112, First Paragraph

Claim 4 stands rejected under 35 U.S.C. § 112, first paragraph. The basis for rejection alleges a failure of enablement. This rejection is respectfully traversed, as explained below.

The Examiner focuses on the portion of claim 4 which recites:

... wherein the laser light source includes a semiconductor laser device which has an active layer made of GaN material so as to emit excitation laser light, and a surface emitting semiconductor laser device which has an active layer made of a GaN material and formed on a substrate, and is excited by the excitation laser light to emit said ultraviolet laser light.

In response, the Examiner's attention is kindly directed to page 12 of the instant specification, second full paragraph, wherein Japanese patent application No. 11 (1999)-257529 is incorporated by reference and which discusses the above-cited features. These features, as described in pertinent portions of Japanese patent application No. 11 (1999)-257529, are herein

amended into the instant specification, thereby providing enablement. Accordingly, enablement now exists in the instant specification for the above-noted features of claim 4. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this rejection.

Additionally, because Japanese patent application No. 11 (1999)-257529 (which was incorporated by reference in the applicant as originally filed) is used as a basis for including the noted subject matter, a verified statement will be forthcoming. The verified statement will affirm that the above-noted subject matter has full support in Japanese patent application No. 11 (1999)-257529 and that no new matter is being introduced.

IV. Rejection of Claims 4 and 5 Under 35 U.S.C. § 112, Second Paragraph

Claims 4 and 5 are also rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite. More precisely, the basis for rejection alleges that the terms “excitation light” and “ultraviolet laser light,” as recited in claims 4 and 5, render the claims indefinite. This rejection is respectfully traversed as explained below.

As to claim 5, the Examiner believes the following recitation to be indefinite:

. . . wherein said laser light source is a fiber laser device including an excitation light source which emits excitation light, an optical fiber doped with at least one rare earth element which emits a laser beam when excited by the excitation light, where the at least one rare earth element includes Pr^{3+} , and a wavelength conversion element which converts said laser beam into said ultraviolet laser light.

In response, it is respectfully averred that the subject matter to which the Examiner objects to in claim 5 is disclosed in the existing drawings and in the instant specification (*see* Fig. 15 and pages 28 - 29). More precisely, Fig. 15 illustrates, and pages 28 and 29 describe, a fiber (F) laser light source (122) including an excitation light source 122 which emits excitation light

(121), on optical fiber doped with at least one rare earth element 126, where the at least one rare earth element includes Pr³⁺ (see page 29, line 11, of the instant specification), and a wavelength conversion element (130) which converts the laser beam (123) into ultraviolet laser light (125). In light of the previous, the Examiner is respectfully requested to reconsider and withdraw this rejection as to claim 5.

Furthermore, as to claim 4, the Examiner's attention is kindly directed to page 12 of the instant specification, wherein Japanese patent application no. 11 (1999)-257529 is incorporated by reference. Pertinent portions of Japanese patent application No. 11 (1999)-257529 is herein amended into the instant specification, thereby allowing the features at issue in claim 4 to be particularly pointed out and distinctly claimed.

That is, the above-referenced amendment of subject matter into the specification provides support for a first laser that emits excitation light, wherein this excitation light is used to excite the active region of a second surface emitting laser, wherein the second laser emits ultraviolet light when stimulated by the excitation light of the first laser. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this rejection.

Additionally, because Japanese patent application No. 11 (1999)-257529 (which was incorporated by reference in the applicant as originally filed) is used as a basis for including the noted subject matter, a verified statement is forthcoming. The verified statement will affirm that the above-noted subject matter has full support in Japanese patent application No. 11 (1999)-257529 and that no new matter is being introduced.

With additional regard to claim 4, the Examiner has provided no art to reject this independent claim. Applicant submits that claim 4 is patentable over any prior art of record.

Moreover, it is noted that the Examiner is required to consider claims in view of the prior art on the merits, regardless of claim status under § 112. *See* M.P.E.P § 2143.03. Therefore, any subsequent art rejection of claim 4 must be provided on a non-final basis.

V. Rejection of Claim 5 Under 35 U.S.C. § 103

With regard to claim 5, this claim stands rejected as allegedly being obvious under 35 U.S.C. § 103 in view of a combination of Aubusson and U.S.P. No. 5,909,306 (“Goldberg”). This rejection is traversed for the following reasons.

The basis for rejection initially characterizes the features of claim 5 as being a simple design choice. In response, it is averred that Pr3 being used as a dopant in such a configuration is not a simple design choice. Further, the combination of Aubusson and Goldberg is not supportable for at least two reasons.

First, as previously indicated in the Parts I and II of this paper, Aubusson suggests that there is no reasonable expectation of success for stimulating the disclosed phosphors using different forms of radiation. In other words, the emission characteristics are heavily dependent on the irradiation characteristics. Goldberg teaches a fundamentally different form of irradiation than Aubusson and the other art of record. In particular, to the extent the laser outputs from the other references can be characterized as UV outputs, Goldberg specifically teaches an output in the infrared range. Therefore, the expectation of success in combining Goldberg with Aubusson is even less likely than in the cases previously discussed.

Second, even assuming that Goldberg and Aubusson could be combined, the references are deficient in not teaching or suggesting every element of independent claim 5. While Goldberg discusses using Er/Yb, Yb and Nd, the reference fails to teach or suggest the use of Pr+

(or any variant thereof). Additionally, neither reference teaches or suggests the use of a wavelength conversion element. While Aubusson does include a distortion compensation device 13 (fig. 1) in the form of an acousto-optic deflector, this device is not a wavelength conversion element. Indeed, the acousto-optic deflector of Aubusson is a *deflector*, not a *wavelength converter*. Therefore, because of the deficiencies noted in the cited art, the Examiner is respectfully requested to reconsider and withdraw this rejection.

VI. Rejection of Claim 7 Under 35 U.S.C. § 103

Claim 7 is rejected under 35 U.S.C. § 103 in view of a combination of Aubusson and Montagu (EO/IR Handbook, Vol. 3, 1993). This rejection is respectfully traversed as explained below.

Claim 7 recites four alternative light source structures, none of which are to be found in either of Aubusson or Montagu. The first of the four alternative light source structures cited in claim 7 is a GaN semiconductor laser. Aubusson fails (as conceded by the Examiner) to teach or suggest a semiconductor laser with an active layer of GaN. Montagu fails to cure this deficiency.

The second through fourth light source structures as recited in claim 7 include an optical wavelength conversion element. As previously explained, Aubusson fails to teach or suggest an optical wavelength conversion element. While Aubusson does include a distortion compensation device 13 (fig. 1) in the form of an acousto-optic deflector, this device is merely a deflector and does not perform the function of a wavelength conversion element. Montagu fails to cure this deficiency. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this rejection in light of the above-noted deficiencies in the cited art.

VII. Rejection of Claim 8 Under 35 U.S.C. § 103

Independent claim 8 recites a spatial light modulating means comprising a spatial light modulator driven by an electromechanical operation that utilizes static electricity. The Examiner rejects this claim under § 103 using a combination of Aubusson, Montagu and Goldberg. This rejection is respectfully traversed as explained below.

As an initial point, the basis for rejection states that claim 8 depends from claim 7. Claim 8, however, has never depended from claim 7, and the Examiner's attention is kindly drawn to this fact.

As to the instant rejection of independent claim 8, Aubusson fails to teach or suggest a spatial light modulator driven by an electromechanical operation that utilizes static electricity. Indeed, Aubusson teaches modulation via adjusting the intensity of the light beam (*see* Aubusson at the top of page 5) and not electromechanical modulation as claimed in claim 8. Moreover, Montagu and Goldberg fail to cure Aubusson's deficiencies. Succinctly, Montagu fails entirely to mention any method of modulation and Goldberg only teaches modulation along the same lines as Aubusson (modulation via changes in intensity (*see* col. 5, lines 29 - 62)). Accordingly, the cited prior art is deficient for not teaching or suggesting an electromechanical modulation operation that utilizes static electricity as in the instant invention. Accordingly, the Examiner is respectfully requested to reconsider and withdraw this rejection.

VIII. Rejection of Claim 9 Under 35 U.S.C. § 103

Claim 9 further recites the spatial light modulator comprising a digital micro mirror device comprising a plurality of movable micro mirrors. For the following reasons, this rejection is respectfully traversed.

The basis for rejection alleges that claim 9 is rendered obvious in view of Aubusson, Montagu and Goldberg. However, none of these references (Aubusson, Montagu and/or Goldberg) teach or suggest a digital micro mirror device comprising a plurality of moveable micro mirrors. Accordingly, in light of the deficiencies of the prior art, the Examiner is respectfully requested to reconsider and withdraw this rejection.

IX. Rejection of Claim 10 Under 35 U.S.C. § 103

Claim 10 depends from claim 8 (thereby incorporating all the features of claim 8) and is thus patentable for the same reasons as is claim 8. Claim 10 further recites the spatial light modulator comprising grating light valve elements of a reflective diffraction grating type. The basis for rejection alleges the previous features of claim 10 to be obvious in view of Aubusson, Montagu, and Goldberg. For the following reasons, this rejection is respectfully traversed.

While the basis for rejection alleges the above-noted features of claim 10 to be obvious in view of Aubusson, Montagu, and Goldberg, none of the references cited teach or suggest the spatial light modulator comprising grating light valve elements of a reflective diffraction grating type. Accordingly, in light of the deficiencies of the prior art, the Examiner is respectfully requested to reconsider and withdraw this rejection.

X. Rejection of Claim 11 Under 35 U.S.C. § 103

Claim 11 depends from claim 7 (thereby incorporating all the features of claim 7) and is therefore patentable for the same reasons as is claim 7. Claim 11 further recites the spatial light modulator comprising reflective diffraction grating type grating light valve elements comprising of a plurality of fixed microelements having a first reflective surface and a plurality of moveable microelements having a second reflective surface, wherein said fixed and movable microelements are alternately arranged on a substrate in a predetermined direction, so that when static electricity is applied, the movable microelements move, changing the distance between the first and second reflective surfaces, thereby diffracting the light incident thereto.

The basis for rejection of claim 11 alleges that a combination of Aubusson with Montagu renders the above-noted features obvious. This rejection is respectfully traversed as follows.

Aubusson utterly fails to at least teach or suggest any microelements, let alone microelements controlled by static electricity. Moreover, Montagu fails to cure the deficiencies of Aubusson. Accordingly, in light of the deficiencies of the prior art, the Examiner is respectfully requested to reconsider and withdraw this rejection.

XI. Rejection of Claim 12 Under 35 U.S.C. § 103

Claim 12 depends from claim 10 (thereby incorporating all the features of claims 8 and 10) and is therefore patentable for the same reasons as claims 8 and 10. The Examiner rejects claim 12 under § 103 as allegedly obvious in view of Aubusson, Montagu and Goldberg. This rejection is respectfully traversed as follows.

Succinctly, none of the prior art references (Aubusson, Montagu, and/or Goldberg) teach or suggest a spatial light modulator comprising a plurality of grating light valve elements, let alone the grating light valve elements in the configuration recited by claim 12. Accordingly, in light of the deficiencies of the prior art, the Examiner is respectfully requested to reconsider and withdraw this rejection.

XII. Rejection of Claim 13 Under 35 U.S.C. § 103

Claim 13 depends from claim 12 (thereby incorporating all the features of claims 8, 10 and 12). Succinctly, the rejection as to this claim is respectfully traversed because none of the references used in the grounds of rejection (Aubusson, Montagu and/or Goldberg) teach or suggest the lengthwise direction of the grating of the grating light valve elements matching the arranging direction of the light modulating array. Accordingly, in light of the deficiencies of the prior art, the Examiner is respectfully requested to reconsider and withdraw this rejection.

XIII. Rejection of Claim 14 Under 35 U.S.C. § 103

Claim 14 depends from claim 10 (thereby incorporating all the features of claims 8 and 10) and is therefore patentable for the same reasons as claims 8 and 10. Moreover, the rejection as to this claim is respectfully traversed in that none of the references used in the grounds of rejection (Aubusson, Montagu and/or Goldberg) teach or suggest the spatial light modulator being positioned so that it is rotated at a predetermined angle in relation to the optical axis around the normal line of the surface thereof. Accordingly, in light of the deficiencies of the prior art, the Examiner is respectfully requested to reconsider and withdraw this rejection.

XIV. Rejection of Claim 15 Under 35 U.S.C. § 103

Claim 15 recites a plurality of GaN semiconductor lasers and is rejected under § 103 as allegedly being obvious in view of Aubusson. This rejection is respectfully traversed as follows.

As noted by the Examiner on page 4, paragraph 9, of the instant Office Action, Aubusson fails to teach or suggest a GaN semiconductor, let alone a plurality of GaN semiconductor lasers. Accordingly, because of the deficiencies of the prior art, the Examiner is respectfully requested to reconsider and withdraw this rejection. Additionally, those arguments presented in Part I of this paper in relation to claim 2's recitation of a GaN laser are herein incorporated as being analogous. For these additional reasons, the Examiner is respectfully requested to reconsider and withdraw this rejection.

XV. Rejection of Claim 16 Under 35 U.S.C. § 103

The Examiner rejects this claim under § 103 as allegedly being obvious in view of Aubusson. For the following reasons, this rejection is respectfully traversed.

Claim 16 recites a plurality of laser light sources and a multiplexing optical system that multiplexes the laser light emitted from the plurality of lasers. One skilled in the art readily recognizes that "multiplexing" means that the plurality of light beams are modulated and transmitted simultaneously. Succinctly, the cited art is entirely deficient in this regard. Accordingly, because of the deficiencies of the prior art, the Examiner is respectfully requested to reconsider and withdraw this rejection.

XVI. New Claims 19 - 23

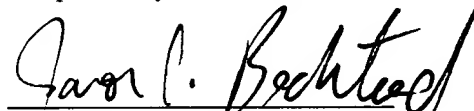
In relation to new claims 19, 20, 21, 22 and 23, it is respectfully averred that such claims are patentable at least by virtue of their ultimate dependency upon claim 2, in addition to their individual recitations.

XVII. Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,



Jason C. Beckstead
Registration No. 48,232

SUGHRUE MION, PLLC
Telephone: (202) 293-7060
Facsimile: (202) 293-7860

WASHINGTON OFFICE

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